

INTRODUCTION TO GROOVED PINS & STUDS

This specification sheet serves as introduction to the Grooved Pin Family, to provide a base understanding of the various fastening options available. To identify the ideal fastening strategy for your need, contact DRIV-LOK. Our Enginomics team will craft a custom solution designed to maximize performance, safety, quality and savings.

DESCRIPTION.

The groove of a grooved pin is formed by a swaging operation in which three tools penetrate the nominal diameter of the metal at 120° intervals. This penetration displaces a controlled amount of metal to each side of the grooving tool, forming a raised portion along the side of each groove.

The crest of these raised portions forms the expanded diameter or "Dx" dimension which is shown in Figure 1. The Dx is a few thousandths larger than the nominal diameter "D" of the pin. The amount of expansion varies with the diameter of the pin, the material being grooved, and the style of groove.

FUNCTION.

When a grooved pin is used, the hole into which the pin is to be inserted is drilled a few thousandths larger than the nominal diameter of the pin. The hole must never be smaller than the nominal diameter of the pin. (See Grooved Pin Drilling Procedures and Hole Tolerances on page 4.)

When the expanded portion of the pin is compressed by insertion into the hole, radial holding forces are generated as shown in Figure 2. These radial forces lock the pin securely into the drilled hole.

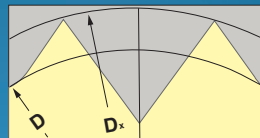


Figure 1

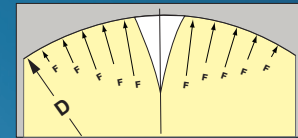
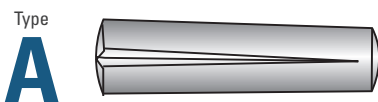
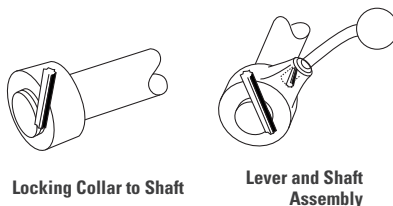


Figure 2

APPLICATIONS.

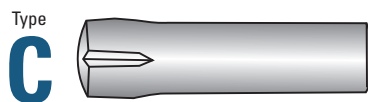


The Type A Pin has three full-length tapered grooves. This popular type is used in applications requiring excellent locking effect and ease of assembly. It is widely used in place of taper pins, rivets, set screws and keys. Typical applications include keying sprockets, gears, collars, knobs, handles, levers and wheels to shafts.

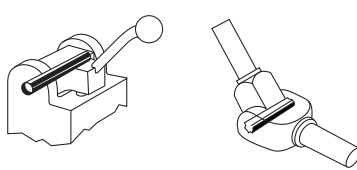


Locking Collar to Shaft

Lever and Shaft Assembly

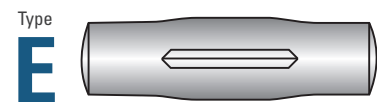


The Type C Pin has three parallel grooves extending one-quarter its overall length. It is ideally suited for linkage or pivot applications, especially where a relatively short locking section and longer free length are required. Widely used in certain types of hinge applications. The long lead permits easy insertion.

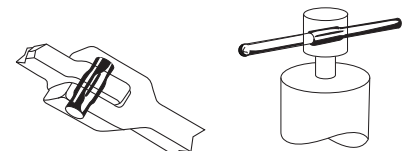


Control Valve Hinge Assembly

Linkage or Hinge Pin

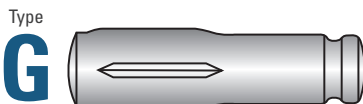


Type E has three parallel half-length grooves located equidistant from each end. Widely used as T handle on valves and tools. Also used as a cross pin, cotter pin, pivot pin, etc., where center locking is required.

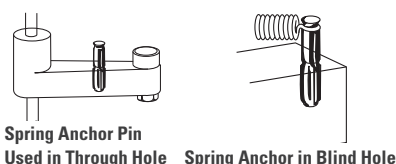


Linkage Pin

T Handle for Valve

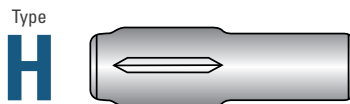


Type G has three parallel half-length grooves including pilot. It is a very versatile pin, suitable for use in both blind and through holes as a spring anchor pin. The annular groove opposite the locking end is used to anchor the end loop of a tension spring. If snap or retainer rings are to be used, special section annular grooves can be machined to order.

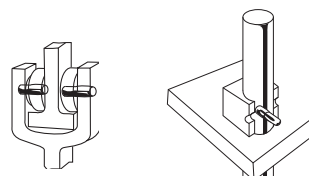


Spring Anchor Pin

Used in Through Hole Spring Anchor in Blind Hole

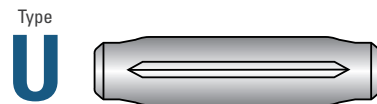


Type H grooved pin has three parallel grooves for half the length of the pin. This type of pin may be used as a pivot, stop or hinge pin. When pressed in place, the grooved portion locks in one part while the ungrooved section remains free to serve as the locator, hinge, etc.

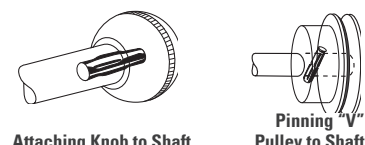


Roller Pins

Stop Pins



Type U has three parallel grooves extending the full length of the pin. A short pilot at each end permits hopper or automatic feeding. Identical ends speed manual insertion as operator need not examine pin to determine proper end to start. Full-length parallel grooves provide maximum locking effect. Typical applications include keying gears, collars, knobs, handles, etc., to shafts.



Attaching Knob to Shaft

Pinning "V" Pulley to Shaft

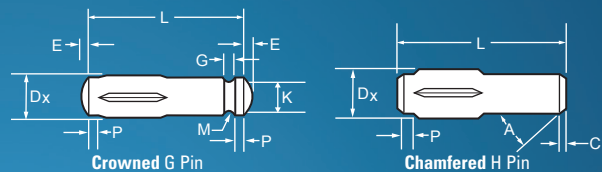
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GROOVED PINS

STANDARD GROOVED PIN DIMENSIONS.

Dimension	Nominal Diameter										
	1/16	3/32	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2
Nominal Diameter	Max.	.0625	.0938	.1250	.1563	.1875	.2188	.2500	.3125	.3750	.5000
	Min.	.0610	.0923	.1230	.1543	.1855	.2168	.2480	.3105	.3730	.4980
Crown Height "E"		.0065	.0091	.0130	.0170	.0180	.0220	.0260	.0340	.0390	.0520
Crown Radius "R" $\pm .010$		3/64	1/8	5/32	3/16	1/4	9/32	5/16	3/8	15/32	1/2
Pilot Length "P" (Ref.)		1/32	1/32	1/32	1/16	1/16	1/16	1/16	3/32	3/32	3/32
Chamfer Length "C" min.		.005	.005	.005	.005	.016	.016	.016	.031	.031	.031
Chamfer Angle "A" $\pm 5^\circ$		35°	35°	35°	35°	35°	35°	35°	35°	35°	35°
Neck Radius "M" (Ref.)		—	1/64	1/32	1/32	1/32	3/64	3/64	1/16	1/16	3/32
Neck Width "G" $\pm .005$		—	.033	.064	.064	.064	.096	.096	.127	.127	.190
Neck Diameter "K" $\pm .005$		—	.062	.083	.104	.125	.146	.167	.209	.250	.312
Shoulder Width "S" $+.010/-0.000$		—	1/32	1/32	3/64	3/64	1/16	1/16	3/32	1/8	t
Lengths* "L" $\pm .010$		1/4 to 1	1/4 to 1 1/4	1/4 to 1 1/2	3/8 to 2	3/8 to 2	1/2 to 2 1/4	1/2 to 2 3/4	5/8 to 2 3/4	3/4 to 3 1/2	1 to 3 1/2

*Length increments are by 1/4 inch up to 1 inch, and by 1/8 inch over 1 inch. Standard availability may vary depending upon groove type. The length of chamfered pins is measured overall from end to end. The overall length of crowned pins is measured at L + 2E. End configuration may vary depending upon pin length and groove type. All dimensions apply prior to plating.



STANDARD EXPANDED DIAMETERS (Dx).

Groove Length	Nominal Diameter										
	1/16	3/32	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2
Expanded Diameter											
	$\pm .0015$	$\pm .002$			$\pm .0025$				$\pm .003$		
1/8	.068	.101	.134	.166	.198	.230	.263	.329			
3/16	.068	.101	.134	.166	.198	.230	.263	.329			
1/4	.068	.101	.134	.166	.198	.230	.263	.329			
5/16	.068	.101	.134	.166	.198	.230	.263	.329	.394	.459	.525
3/8	.068	.101	.134	.166	.198	.230	.263	.329	.394	.459	.525
7/16	.068	.101	.134	.166	.198	.230	.263	.329	.394	.459	.525
1/2	.068	.101	.134	.166	.198	.230	.263	.329	.394	.459	.525
3/16	.068	.101	.134	.166	.198	.230	.263	.329	.394	.459	.525
5/8	.068	.101	.134	.166	.198	.230	.263	.329	.394	.459	.525
3/4	.067	.100	.134	.166	.198	.230	.263	.329	.394	.459	.525
7/8	.067	.100	.133	.165	.198	.230	.263	.329	.394	.459	.525
1	.067	.100	.133	.165	.198	.230	.263	.329	.394	.459	.525
1 1/4		.100	.132	.164	.197	.230	.263	.329	.394	.459	.525
1 1/2			.132	.164	.197	.229	.262	.329	.394	.459	.525
1 3/4				.163	.197	.229	.262	.328	.393	.459	.525
2				.163	.196	.229	.262	.328	.393	.458	.525
2 1/4						.229	.262	.328	.393	.458	.524
2 1/2							.261	.327	.393	.458	.524
2 3/4							.261	.327	.393	.458	.524
3									.392	.457	.523
3 1/4									.392	.457	.523
3 1/2									.391	.456	.522

Nom. Diam. (D)	Exp. Diam. (Dx) reduced by
1/16	.002
3/32	.002
1/8	.002
5/32	.002
3/16	.003
7/32	.003
1/4	.003
5/16	.004
3/8	.005
7/16	.006
1/2	.006

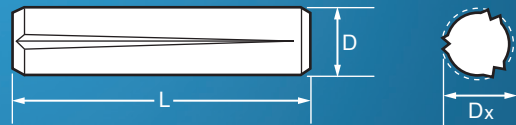
TOLERANCES:

On Nominal Diameter "D":
 $+.000/-0.0015$ up to 3/64" diameter
 $+.000/-0.002$ 1/4" diameters and over

On Overall Length "L":
 $\pm .010$ for all diameters

For stainless steel and other special materials, the expanded diameters shown in the table are reduced by amounts shown at left.

Note: Intermediate pin lengths, pin diameters up to 3/4", groove lengths, and special groove positions are ordered as specials.

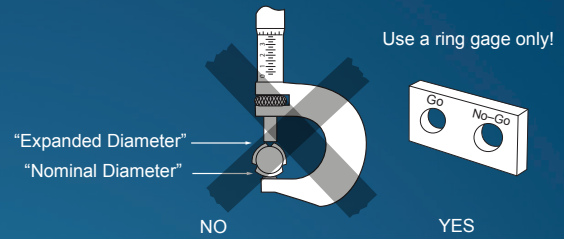


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GROOVED PINS

CHECKING EXPANDED DIAMETERS.

As shown, expanded diameters cannot be accurately measured using a micrometer. For accurate measurement of expanded diameters, use a class Z ring gage only!



GROOVED PIN DRILLING PROCEDURES AND HOLE TOLERANCES.

Insertion and holding forces vary with hole size and groove length. Recommended hole size tolerances are based on a groove length to hole diameter ratio of approximately 5 to 1. A higher ratio than 5 to 1 may require adjustment in hole size. If the ratio is 1 to 1 or less then the hole tolerance should be reduced by approximately 60%. Smaller hole size variation should result in more consistent insertion forces. These factors should be considered when designing press fit fasteners for your application.

Hole sizes should never be smaller than the nominal diameter of the grooved pin. Minimum hole size equals nominal grooved pin diameter. Maximum hole size equals minimum hole size plus recommended hole tolerance from the chart.

Example:

$\frac{1}{8}$ diameter pin: Min. hole = .125
Max. hole = .125 + .003 = .128

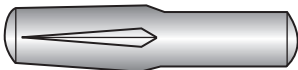
Pin Diameter	Decimal Equivalent	Recommended Drill Size	Hole Tolerances ADD to Nominal Diameter
$\frac{1}{16}$ "	.0625"	$\frac{1}{16}$ "	.002"
$\frac{3}{32}$ "	.0938"	$\frac{3}{32}$ "	.003"
$\frac{1}{8}$ "	.1250"	$\frac{1}{8}$ "	.003"
$\frac{5}{32}$ "	.1563"	$\frac{5}{32}$ "	.003"
$\frac{3}{16}$ "	.1875"	$\frac{3}{16}$ "	.004"
$\frac{7}{32}$ "	.2188"	$\frac{7}{32}$ "	.004"
$\frac{1}{4}$ "	.2500"	$\frac{1}{4}$ "	.004"
$\frac{5}{16}$ "	.3125"	$\frac{5}{16}$ "	.005"
$\frac{3}{8}$ "	.3750"	$\frac{3}{8}$ "	.005"
$\frac{7}{16}$ "	.4375"	$\frac{7}{16}$ "	.006"
$\frac{1}{2}$ "	.5000"	$\frac{1}{2}$ "	.006"

A slight chamfer on the hole is recommended particularly with holes in hardened steel, cast iron, and with hardened grooved pins.

TYPICAL OPTIONAL GROOVE TYPES.

Type

D



Type D has three reverse taper grooves extending one-half the length of the pin. Recommended for use in blind holes as a top pin, roller pivot, dowel, or for certain hinge or linkage applications. Reverse taper grooves permit easy insertion in blind holes.

Type

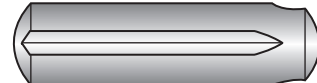
B



Type B Pins have three tapered grooves extending one-half the length of the pin. This type is widely used as a hinge or pivot pin. Driven or pressed into a straight drilled hole, the grooved portion locks in one part, while the ungrooved portion will remain free. Also excellent for dowel and locating applications.

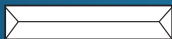
Type

A3



Type A3 Pins have three full-length parallel grooves with a short pilot to insure easy starting. They are recommended for applications requiring maximum locking effect where severe vibration and/or shock loading are present.

TYPICAL GROOVE CONFIGURATIONS.



Square



Oval



Diamond



Tapered

CHOICE OF END CONFIGURATION.



Spherical End



Annular Groove



Crowned End



Chamfered End

DRIV-LOK

HIGH ALLOY *SHEAR-PROOF™ PINS

DESCRIPTION.

Standard SHEAR-PROOF™ pins have the Type A groove configuration as shown. This groove configuration provides tapered expansion beginning at one end of the pin and expanding to the maximum at the opposite end of the pin. Insertion of the Type A pin is allowed in one direction only. SHEAR-PROOF™ pins are available in any groove configuration.

SHEAR-PROOF™ pins are manufactured from 4140 or 6150 alloy steel in the same manner as grooved pins and are heat treated by austempering to a Rockwell "C" 40-48 hardness. Austempering provides a bainitic microstructure which is tougher than a martensitic microstructure produced by standard oil quenches. SHEAR-PROOF™ pins are furnished with a light oil finish for corrosion-resistance.

FUNCTION.

SHEAR-PROOF™ pins lock in place in the same manner as grooved pins. The materials and the strength or hardness level to which SHEAR-PROOF™ pins are heat treated provide ideal shear resistance.

TOLERANCES:

Length: $\pm .010$

Nominal Diameter: $+.000/- .0015$ up to $7/64$ " diameter
 $+.000/- .002$ $7/64$ " diameter and over

Expanded Diameter: See table on page 3.

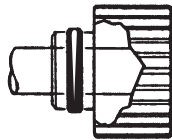
*NOTE: "SHEAR-PROOF" is a registered trademark of DRIV-LOK, Inc. The name "SHEAR-PROOF" refers only to a product manufactured from alloy steel and heat treated to obtain a higher shear resistance than standard low carbon grooved pins-type A. The name "SHEAR-PROOF" does not imply the pins will not shear. "SHEAR-PROOF" pins will meet the performance (minimum shear) detailed on Page 17 of this catalog when tested in a properly designed test fixture.

TYPICAL APPLICATIONS.



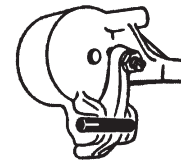
Material Handling Equipment

The Type E pin provides positive locking with a half-length groove in the center of the pin. Extreme shear is exerted in this application, yet the SHEAR-PROOF™ Pin is used with complete safety for both men and materials. Type E SHEAR-PROOF™ is a special pin.



Heavy-Duty Gear and Shaft Assembly

Type A SHEAR-PROOF™ Pin as specified for this application to give maximum locking power over the entire pin and gear hub area. The Type A Pin, with grooves the full length of the pin, is the standard stock pin which meets most applications.



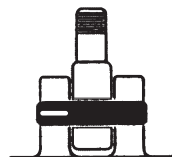
Automatic Transmission in Automobiles

Special Type C SHEAR-PROOF™ was selected as a shaft in this transmission servo to replace a cross drilled shaft with a cross pin for holding shaft in position. This eliminated a costly drilling operation and the cross pin.



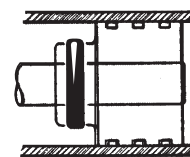
Universal Joints in Hand Tools

Special Type E SHEAR-PROOF™ Pin with center grooves eliminates costly staking and grinding operations and improves product appearance. This pin is easily installed, fits flush and permits plating before assembly.



Eye Bolt Hinge Pin

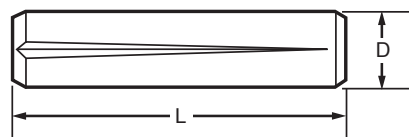
Type C pin, with quarter-length grooves, provides maximum ease of assembly. There is no interference until three-fourths of the pin is in position. The high safety factor inherent in SHEAR-PROOF™ Pins makes them practical and efficient for such constant shear applications. Type C SHEAR-PROOF™ is a special pin.



High Pressure Piston and Rod Assembly

Type B Pin was used here because the half length grooves simplified the job of starting the pin into the hole. Ease of assembly was matched with sufficient locking power even when subjected to continuous, strong reciprocating forces. Type B SHEAR-PROOF™ is a special pin.

STANDARD TYPE A.

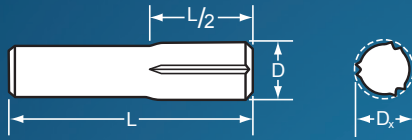


DRIV-LOK

HARDENED LOK-DOWELS™

DESCRIPTION.

Standard Lok-Dowels™ are made from cold-finished low carbon steel and have a special groove configuration as shown. They are centerless ground, polished, and case hardened to provide good wear resistance.



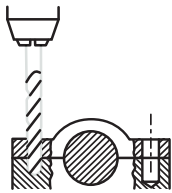
FUNCTION.

Lok-Dowels™ are pressed or driven into a drilled and reamed hole. The grooved portion of the Lok-Dowel remains in place while the ungrooved end of the pin is easily removed from the mating part. The expanded diameter allows a greater hole tolerance to be used with a Lok-Dowel™ than can be used with a regular dowel pin.

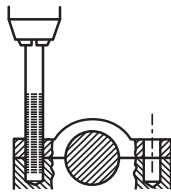
LOK-DOWEL™ DIMENSIONS.

Nominal Diameters	1/8	3/16	1/4	5/16	3/8	1/2
Decimal	.1245	.1870	.2495	.3120	.3745	.4995
Specification	.1250	.1875	.2500	.3125	.3750	.5000
Expanded	.130	.194	.257	.321	.384	.511
Diameter	.133	.197	.260	.324	.387	.514

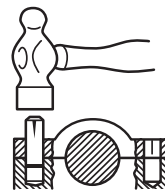
INSTALLATION PROCEDURE.



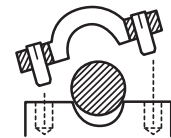
Drill hole slightly undersize.



Ream full size.



Drive or press Lok-Dowels™ into place.



Lok-Dowels™ lock securely and parts separate easily.

DRIV-LOK

GROOVED STUDS

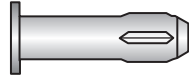
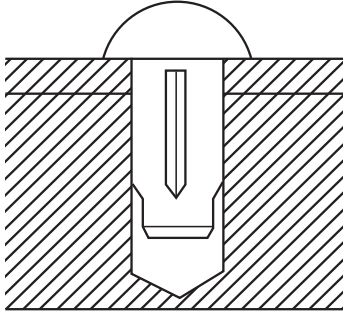
DESCRIPTION.

Grooved studs have three parallel grooves spaced at 120° intervals around the diameter of the shank. Standard grooved studs are manufactured from low carbon-steel and are zinc-plated for corrosion resistance.

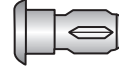
FUNCTION.

Grooved studs function in the same manner as grooved pins. They provide the same positive holding features as grooved pins plus additional end loading resistance provided by the head of the stud.

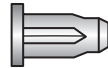
SPECIAL STUDS.



Flat-head special stud with one-third length groove at lead end. Groove length can be varied.



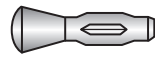
Flat-head special grooved stud with shoulder. Often hardened to provide wear surface in shoulder area.



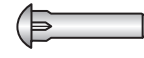
Flat-head grooved stud.



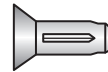
Round-head reverse taper groove stud.



Stud with conical head and parallel grooves.



Round-head stud with parallel grooves of special length.



Countersunk head grooved stud.



"T" head cotter used extensively in chain industry in place of cotter pins.

STANDARD STUDS.

Standard studs are manufactured to ASME B18.8.2 specifications. Standard stud sizes available are from #0 through #16 and lengths from 1/8" through 3/4" as shown in the table below.

SPECIAL STUDS.

In addition to standard round head grooved studs, flat heads, button heads, and T-heads are also available by special order. DRIV-LOK's engineering staff will work with customers to provide technical assistance. Special materials, diameters, shank lengths, end configurations, and finishes are available by request as special orders.

STANDARD GROOVED STUD SIZES.

	Stud Number/Nominal Diameter									
	#0 .067	#2 .086	#4 .104	#6 .120	#7 .136	#8 .144	#10 .161	#12 .196	#14 .221	#16 .250
Lengths	Expanded Diameter									
1/8	.074	.096								
3/16	.074	.096	.115							
1/4	.074	.096	.113	.132						
5/16			.113	.130	.147					
3/8				.130	.147	.155	.173			
1/2					.144	.153	.171	.206	.234	.263
5/8						.153	.171	.201	.232	.261
3/4								.201	.232	.261
Tolerances: Shank length: ±.010 Nominal Diameter: +.000/-.002 Expanded Diameter: ±.002										

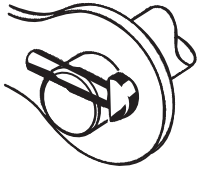
STANDARD SIZES AND SPECIFICATIONS.

Stud Number	Nominal Shank Diameter	Recommended Drill Size	Head Diameter		Head Height	
			Max.	Min.	Max.	Min.
0	.067	51	.130	.120	.050	.040
2	.086	44	.162	.146	.070	.059
4	.104	37	.211	.193	.086	.075
6	.120	31	.260	.240	.103	.091
7	.136	29	.309	.287	.119	.107
8	.144	27	.309	.287	.119	.107
10	.161	20	.359	.334	.136	.124
12	.196	9	.408	.382	.152	.140
14	.221	2	.457	.429	.169	.156
16	.250	1/4	.472	.443	.174	.161

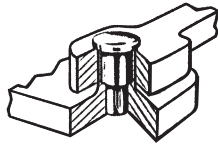
DRIV-LOK

GROOVED STUDS

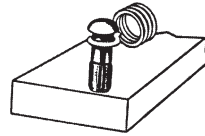
APPLICATIONS.



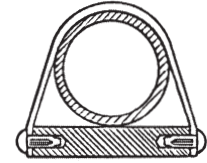
"T" head cotter in chain



Linkage assembly



Spring anchor



Widely used for fastening brackets

